Life of Sir W. E. Logan. By Bernard J. Harrington. 8vo. Pp. 432. London: Sampson Low and Co., 1883.

In this interesting volume the author has done good service by bringing together from many sources, and connecting into a continuous narrative, details of the life and work of one of the most devoted and single-hearted of British scientific men and public servants. We gather from the preface that the author's task was not self-imposed, and that he to a certain extent laboured under the disadvantage of not having known Sir William Logan in the earlier years of his work in Canada; but having undertaken the work, he has endeavoured to bring together such of Sir William's own words as will recall him to the minds and hearts of old friends, or enable those who were not privileged with his acquaintance to form an estimate of his character and work; and these objects he may be considered as having fairly accomplished.

William Edward, the third child and second of the five sons of William and Janet Logan, was born at Montreal on the 20th April 1798, and after receiving his early schooling from Mr. Alexander Skakel, a determined Scotchman thoroughly well acquainted with the art of flogging, but a good classical scholar and successful teacher, was in 1814 sent with his elder brother to the High School of Edinburgh, then in the zenith of its reputation. In 1817 he became a student of the University, receiving the first prize in mathematics, "with the goodwill of all the competitors," at the end of his single session at College, when his university career was brought to a sudden close by a resolution to enter into commercial life. He was received into the office of his uncle, Mr. Hart Logan, in London; and for the following thirteen years his life was that of a city man, with occasional holidays passed in France and Scotland. In 1831, his uncle having become interested in a process for smelting copper furnace-slags, William Logan undertook the business management of the works at Morriston, near Swansea; and it was during his residence in Wales, extending over the period 1831–37, that the true bent of his genius towards stratigraphical geology first became apparent in the remarkable map of the South-Wales coal-field, laid down upon the then recently completed sheets of the one-inch Ordnance map of the district, which was exhibited at the meeting of the British Association at Liverpool in 1837. This, when subsequently incorporated by Sir Henry de la Beche into the maps of the Geological Survey, formed the standard for mapping the details of the other coal-fields in the kingdom. Another valuable service rendered as a volunteer by Logan to the Geological Survey was the introduction of the large sections on the uniform scale of six inches to the mile, which have been invariably used subsequently. In 1837 he was elected a Fellow of the Geological Society, and in 1840 contributed to its 'Transactions' an important paper "On the Underclays of the Coal-seams of South Wales," which he showed, from the invariable presence in them of the roots of *Stigmariæ*, to be the soils upon

which the plants forming the coal-seams originally grew. This generalization he subsequently verified in the coal-fields of Pennsylvania and Nova Scotia. In the latter locality he was the first (in 1841) to observe the traces of reptilian footprints in the Carboniferous system, a fact which has been somewhat overlooked by subsequent observers; but Logan's claim is vindicated by his friend and life-long associate Principal Dawson, in his work on the air-breathers of the coal-period, published in 1863.

After retiring from the management of the copper-works, subsequent to the death of his uncle in 1838, Logan returned to Canada in 1840 and was engaged in the researches last mentioned on the coal of the United States and maritime provinces. In the course of his explorations he was much impressed with the great mineral wealth of the basin of Pennsylvania, and had some thoughts of establishing himself as a coal-viewer in the United States; but upon the determination of the provincial government of Canada to institute a Geological Survey in 1842, he was, on the unanimous recommendation of the leading English geologists, De la Beche, Murchison, Sedgwick, and Buckland, appointed to undertake it, which he did in the spring of 1843, having for his sole assistant Mr. Alexander Murray, who was his constant associate during the whole time of his work in Canada, and subsequently directed the Survey of Newfoundland. Thenceforward for more than a quarter of a century Logan's life was entirely devoted to the working-out of the geological structure of his native country. He commenced in the eastern district of Gaspé, on the south shore of the Saint Lawrence, among Carboniferous and Devonian strata, and proceeded along the shores of Lakes Huron and Superior, through the valley of the Ottawa, and along the Labrador coast, all of which, now become familiar places to the student of American geology, were then unknown to geologists, and scarcely, if at all, topographically delineated, at any rate for more than a short distance from the shores of navigable waters, where hydrographic surveys had extended. This absence of topographical maps added enormously to the labours of the work; and for several years the method of traverse-surveys by counting paces and compass-bearings was added to the geological work proper, with the result of furnishing valuable additions to the cartography of the province; while the courses of streams navigable by canoes were plotted from similar surveys, in which the distances were determined by the Rochon micrometer-telescope. The value of the latter part of the work was specially noticed by Captain (afterwards Admiral) Bayfield, R.N., the Admiralty surveyor of the Saint Lawrence. The privations and discomforts experienced in the earlier years of Logan's work in Canada are abundantly evidenced by the numerous extracts from his journals describing incidents of camp life and references to a somewhat sparse dietary, in which spruce-partridges, porpoises, and porcupines figure largely, the last being spoken of as especially acceptable additions to the larder, while the short commons were aggravated by the persistent worries of mosquitoes and black flies during the greater part of the working

season. These privations and discomforts, it must be remembered, were encountered not by a young beginner having to make a way in life, but by a successful business man of mature years and large means, in the carrying-out of a self-imposed life-work, to which all Logan's energies were devoted without stint or reserve. Besides personal work, large sums of money were often advanced when the necessities of the government led to the reduction of the annual grants for a term of years. The work thus partially outlined met at last with a hearty recognition both in the colony and in Europe, especially when the magnificent collections made during the progress of the Survey were exhibited in the different international exhibitions in London and Paris from 1851 to 1868. Logan received the honour of knighthood in 1856, and was made Chevalier of the Legion of Honour in 1855, and Officer in 1867.

The more important portions of the scientific work of Sir W. Logan may, in the author's words, be summed up as follows :—

1. Investigations with regard to the origin of coal, which resulted in the establishment of the fact of the local origin of seams from growth in place.

2. The establishment of the Laurentian system as a great group of stratified crystalline rocks divisible into several groups, and containing at certain horizons evidences of organic life of the foraminiferal type (*Eozoon canadense*), the latter having been worked out jointly with Principal Dawson and Dr. Sterry Hunt.

3. The proof of the existence of a newer series of crystallized stratified rocks, the Huronian, resting unconformably on the Laurentian.

4. The identification of various formations younger than the Huronian, and the establishment of the fact that the lower palæozoic rocks rest unconformably upon the Laurentian and Huronian strata.

5. The production of numerous admirable geological maps, including not only the work of his own survey, but that of the geologists in the maritime provinces and the northern United States. The numerous official reports made at intervals during the progress of the survey formed the basis of the volume entitled 'Geology of Canada,' published in 1863, and which was the chief literary work of Sir W. Logan, in the preparation of which, however, he was largely assisted by Dr. Sterry Hunt. This is so well known that it will be unnecessary to go into detail as to its contents further than to state that it has been everywhere regarded as a model of what the geological handbook of a country should be, both as regards stratigraphical details and the accessory subjects of mineral and economic geology ; and in these respects, though now nearly twenty years old, it remains unmatched by any similar subsequent publication.

The large geological map on the scale of 25 miles to the inch was among the latest as well as one of the finest of Logan's works, being remarkable for the beauty of execution and colouring. In the latter particular he took extreme pains ; and the writer of the present

notice well remembers the long hours of work devoted to it in the Survey Office in Jermyn Street, the illustrious investigator, then full of years and honours, having thought it necessary to prepare the work in its minutest details for the publisher with his own hands—an example that might well be followed by some of our younger geologists, who, while bold in speculation, are not always so anxious to illustrate their opinions graphically as they might be.

In 1869 Sir William resigned the directorship of the Survey, but continued to occupy himself at intervals with geological investigations, in part caused by new and controversial views as to some of the earlier work on the eastern townships, which was incomplete when he left the colony for the last time in August 1874.

During the winter of that year, passed with his sister in South Wales, the disease to which he had been some time subject made rapid progress; and thenceforward, with a few brief intervals of improvement, he became progressively weaker, and finally passed to his rest on the 22nd of June 1875, in the 78th year of his age.

As an investigator into the intricacies of stratigraphical structure Logan was perhaps without an equal: and in the establishment of exact geological mapping as now practised in the British and other national Surveys his work was second only to that of his illustrious contemporary, Sir Henry de la Beche.

The author, though evidently without much personal knowledge of the subject of his memoirs, has done his work well, especially in the numerous selections made from journals and letters. Some of the latter, otherwise properly inserted at the end of the volume, contain details that might have been judiciously omitted. H. B.

A Monograph of North-American Phyllopod Crustacea. By A. S. Packard, Jun. 8vo. Washington: 1883. Extracted from the Twelfth Annual Report of the U.S. Geological and Geographical Survey. F. V. Hayden, U.S. Geologist in Charge.

This is a very comprehensive, well worked, and useful Monograph, based largely, but not wholly, on the consideration of North-American forms, and comprising:—I. The classification of the living Phyllopodous species; II. The geological succession of fossil forms; III. Geographical distribution of the existing species; IV. External and internal anatomy; V. Development and metamorphoses; VI. Relation to their environment; VII. Relations of the Phyllocarida (*Nebalia* &c.) to the Phyllopoda; and VIII. Bibliography. The following is the system and order of treatment in detail:—I. Phyllopoda, Latreille (p. 296), history and characters. Family *Limnadiadæ*, Baird (p. 297). Subfamily *Limnetinæ*, Packard, genus Limnetis, Lovén (p. 298); species (American) *Gouldii*, Baird, *mucronatus*, Packard; *brevifrons*, Pack., *gracilicornis*, Pack. Subfamily *Estherianæ*, Pack. Genus Estheria, Rüppell (p. 303): American species, *californica*, Pack., *Newcombii*, Baird, *complexi-manus*, n. sp., *mexicana*, Claus, *Morsei*, Pack., *Belfragei*, Pack., *Jonesii*, Baird. Genus Limnadia, Brongniart (p. 311): American